TWO NEW *MOELLENDORFFIA* SPECIES AND ONE NEW *TRICHELIX* SPECIES (GASTROPODA, EUPULMONATA, CAMAENIDAE) FROM SOUTHERN CHINA

RAN-XI LIN[1] & LI-WEN LIN[2]

[1]College of Ship and Ocean Engineering, Guangzhou Maritime University, Guangzhou 510725, P. R. China
[2]Jiahe Road 354, Dongfangbali 362, Huli District, Xiamen 361009, P. R. China

Abstract *Two new* Moellendorffia *species from Guangxi Zhuang Autonomous Region, China,* Moellendorffia kuguaheshang *sp. nov. [苦僧多粒螺] and* Moellendorffia qinglongi *sp. nov. [清龙多粒螺], along with one new* Trichelix *species from Hunan Province, China,* Trichelix xiaoxiang *sp. nov. [潇湘绒粒螺], are described and photographed in this paper. Illustrations of the new species and SEM micrographs of the protoconch of* Moellendorffia kuguaheshang *sp. nov. are provided.*

Key words *South China, taxonomy, new species, systematics*

INTRODUCTION

According to Ancey's original description (1887) of the genus *Moellendorffia* and *Trichelix*, some of the species formerly included within the genus *Helix* were transferred to these two genera, which share some features like complex apertural teeth, furrows on the outer shell surface near the aperture and a velvet to shaggy periostracum. Pilsbry (1905) treated *Trichelix* as a subgenus of *Moellendorffia* based on similarities in shell morphology. The genus *Moellendorffia* is conchologically characterised by the more or less convex spire, periostracal hairs, a granulous or smooth shell surface and a detached aperture with three to four apertural teeth. Compared with *Moellendorffia*, *Trichelix* has shorter and denser hairs on the periostracum and a finer surface sculpture. Moreover, *Trichelix* is distinguished by the flattened to concave spire, one or two furrows near the aperture and a weak to strong parietal callus inside the aperture.

More recently, the anatomy of these two genera was researched by Habe (1957), Minato (1971, 1980), Schileyko (2003) and Panha *et al.* (2010). Schileyko (2003) concluded that the genital anatomy of *Trichelix* was not uniform, varying according to the presence or absence of a flagellum and different lengths of the epiphallus.

In geographical distribution, *Moellendorffia* species are unexceptionally endemic to southern continental Asia (Yen, 1942 and Schileyko, 2011) while the distribution of *Trichelix* expands to Taiwan Island and the central Ryukyu Islands (Wu *et al.*, 1998; Minato, 2011).

The genera *Moellendorffia* and *Trichelix*, together with their relative *Moellendorffiella* Pilsbry, 1905, have recently been systematically reviewed with a type catalogue (Sutcharit *et al.*, 2020). In the aforementioned work, nine valid species with three valid subspecies of *Moellendorffia* were recognised, and among these species and subspecies five were from China while seven were from Vietnam. The recorded localities of many species are in Northern Vietnam and close to the Chinese-Vietnamese border. Chinese *Moellendorffia* species have been recorded from Guangdong, Guangxi, Hunan and Hongkong. Only one species, *M. dengi*, was recorded from Guangxi before the present work. Six valid species of *Trichelix* were recognised, of which only one, *Trichelix biscalpta*, is distributed in the Chinese mainland (Sutcharit *et al.*, 2020).

In this paper, two new *Moellendorffia* and one new *Trichelix* species are described from Guangxi Zhuang Autonomous Region and Hunan Province, China, together with a comparison of shell specimens. Images of the shells and a distribution map of the new species are provided. The type localities of the two new *Moellendorffia* species are in the southwest of Guangxi which is adjacent to Northern Vietnam. The affinities and differences between the two new species and some similar species from Northern Vietnam are discussed.

Contact author : linranxi2001@163.com

Materials and Methods

Electron micrographs were taken using a FEI Quanta 450 FEG Scanning Electron Microscope. The calculation of shell whorls follows the criteria of Kerney & Cameron (1979). The names of administrative units below provincial level are given in Chinese Pinyin (Shi=city, Xian=county, Zhen=town).

Abbreviations
HBUMM: Mollusc collection of the Museum of Hebei University (Baoding, China); LLW: Collection by Li-Wen Lin (Xiamen, China); LRX: Collection by Ran-Xi Lin (Zhanjiang, China); OKC: Collection by Kai-Chen Ouyang (Kunming, China); SZA: Collection by Zi-Ang Shi (Wuhan, China).

Systematics

Family Camaenidae Pilsbry, 1895
Subfamily Camaeninae Pilsbry, 1895
Genus *Moellendorffia* Ancey, 1887

Type species by original designation: *Helix trisinuata* Martens, 1867.
Moellendorffia kuguaheshang sp. nov.

Holotype Shell diameter: 18.2mm, shell height: 6.8mm. China, Guangxi Zhuang Autonomous Region, Nanning Shi [南宁市], Longan Xian [隆安县], Dingdang Zhen [丁当镇]. 23°57.35'N, 107°57.35'E, leg. Yu-Hua Lan, 2021.5.13. HBUMM10051.

Paratypes Three shells: LLW/2 (empty shells); SZA/1 (empty shell), same data as holotype.

Diagnosis Shell depressed conical, keel, keel perimeter with long bristles, palatal lamella larger than prominent nodule, columellar lamella distinct.

Description Shell (Fig. 1A) depressed conical, rather lenticular and thin, uniformly reddish brown, dextral, comprising 3.75–3.90 whorls. Suture somewhat depressed. Spire low, slightly domed. Body whorl clearly descending behind aperture. Protoconch surface with numerous regularly arranged rectangular granules which bear short scales (Fig. 2), short scale mean length about 34μm, also visible from the ventral side. Body whorl with strong keel above periphery. Tubercles on keel and keel perimeter with long bristles, mean length of bristles about 0.9mm. Aperture vastly extended, squarish, free from preceding whorl. Peristome expanded, equally reflected. Parietal wall elevated to form prominent nodule, nodule transition from red to white; one sharp and white palatal lamella, larger than prominent nodule; one tiny but distinct columellar lamella. Umbilicus obvious, open, large and deep, approximately ¼ of shell diameter and through which the protoconch is visible.

Soft body Full-bodied fuscous, central dorsum with yellowish longitudinal stripes. Tentacles darker.

Measurements Shell major diameter: 16.1–18.2mm, shell height: 6.6–6.9mm (n=4).

Derivation of name This species is named after Tao-Shi [石涛], the painter between the Ming and Qing Dynasty who was native to Guangxi Zhuang Autonomous Region and was known as the Bitter Melon Monk, which is spelled as ku-gua-he-shang in Chinese Pinyin. The shell surface resembles the surface protrusion of the bitter melon. This name is a noun in apposition.

Geographical range This species is known from the type locality only.

Habitat This snail lives in the deciduous zone of the karst landscape and occasionally climbs higher (Y.-H. Lan, personal comm.).

Remarks The new species is easily distinguished from other *Moellendorffia* spp. by the lower spire, relatively sparser hair and the enlarged aperture (Sutcharit *et al*., 2020). Compared with *Moellendorffia eastlakeana* (Möllendorff, 1882), the aperture of the new species extends further outward (Panha *et al*., 2010) and the hair is relatively sparser. *Moellendorffia loxotata* (Mabille, 1887) has a darker shell colour and two lamellae can be distinguished. Compared with *Moellendorffia trisinuata sculpticoncha* (Zilch, 1951), the new species has fewer verrucous grains and a lower spire. *Moellendorffia dengi* Yang *et al*. 2012 is known only from Baise Shi [百色市], Leye County [乐业县] and also has an enormous umbilicus; however, the new species has longer hair scars and a prominent keel.



Figure 1 Photographs of two *Moellendorffia* species. A, *Moellendorffia kuguaheshang* sp. nov. (holotype, HBUMM10051, China, Guangxi Zhuang Autonomous Region, Nanning shi, Longan Xian, Dingdang Zhen). B, *Moellendorffia qinglongi* sp. nov. (holotype, HBUMM10052, China, Guangxi Zhuang Autonomous Region, Chongzuo Shi, Daxin Xian.). Photographer Zhe-Yu Chen, Li-Wen Lin.

Moellendorffia qinglongi sp. nov.

Holotype Shell diameter: 18.7mm, shell height: 7.6mm. China, Guangxi Zhuang Autonomous Region, Chongzuo Shi [崇左市], Daxin Xian [大新县]. 22°50.16'N, 107°9.18'E, leg. Qing-Long Zhou, 2021.5.7. HBUMM10052.

Paratypes Two shells: OKC/1 (empty shell); LRX/1 (empty shell), same data as holotype.

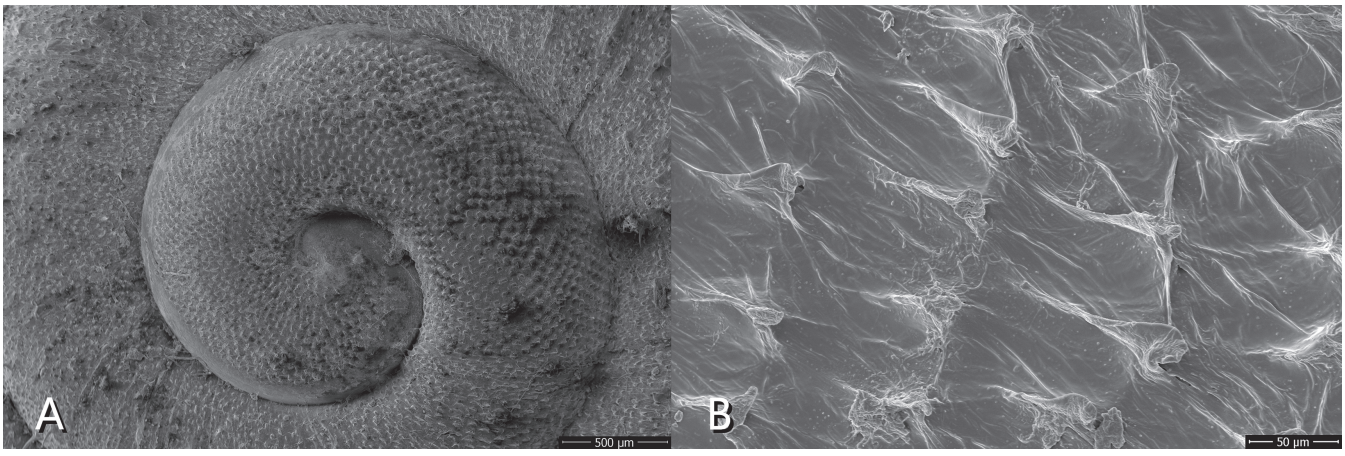


Figure 2 Scanning electron microscope pictures of *Moellendorffia kuguaheshang* sp. nov. A, protoconch. B, sculpture on teleoconch. Photographer Zi-Ang Shi.

Diagnosis Shell depressed conical, yellowish, without long bristles. Body whorl with uniformly distributed protuberance. Palatal lamella larger than parietal nodule, columellar lamella low.

Description Shell (Fig. 1B) depressed conical, rather lenticular and thin; uniformly yellowish, dextral, comprising 4.25–4.35 whorls. Suture rather impressed. A descending pattern of tubercles on the penultimate and body whorls. Protoconch surface somewhat smooth, with smaller tubercles. Body whorl with relatively blunt keel above periphery, with protuberance. Aperture extended, squarish, free from preceding whorl. Peristome expanded, equally reflected. Parietal wall elevated to form one small and white prominent nodule; one feeble and white palatal lamella that is larger than parietal nodule; one tiny and low columellar lamella. Umbilicus obvious, large and shallow, approximately 2/5 of shell diameter and through which the protoconch is visible.

Soft body Full-bodied fuscous, central dorsum with yellowish longitudinal stripes. Tentacles darker.

Measurements Shell major diameter: 18.6–18.8mm, shell height: 6.9–7.9mm (n=3).

Derivation of name This species is named after Mr Qing-Long Zhou, the collector of the type materials.

Geographical range This species is known from the type locality only.

Habitat The humus on moist soil in the karst landscape; the shells blend in with fallen leaves. The population density in the field is relatively low (Q.-L. Zhou, personal comm.).

Remarks The new species can be distinguished from most other species in the genus by the absence of long bristles on the shell surface. *Moellendorffia hensaniensis* (Gredler, 1885) and *Moellendorffia trisinuata* (Martens, 1867) have very smooth surfaces and almost no spines. Compared with *M. hensaniensis,* the new species has a paler shell colour, the body whorl is not prominent and the shell has shouldered whorls. Compared with *M. trisinuata*, the umbilicus of the new species is larger and shallower, and the degree of descent of the body whorl is smaller (Panha *et al*., 2010); it can also be distinguished by the type locality (Yen, 1939). The new species differs from *M. dengi* in having a distinct shell form with a strong keel and a smaller protuberance.

Genus *Trichelix* Ancey, 1887

Type species by original designation: *Helix horrida* Pfeiffer, 1863.

Trichelix xiaoxiang sp. nov.

Holotype Fresh mature shell, shell diameter: 22.4mm, shell height: 9.3mm. China, Hunan Province, Yongzhou Shi [永州市], Jiangyong Xian [江永县], 40-m-high stony hill in the suburb. 25°16.52'N, 110°20.46'E, leg. Hao-Fei Fan, 2021.11.19. HBUMM10059.

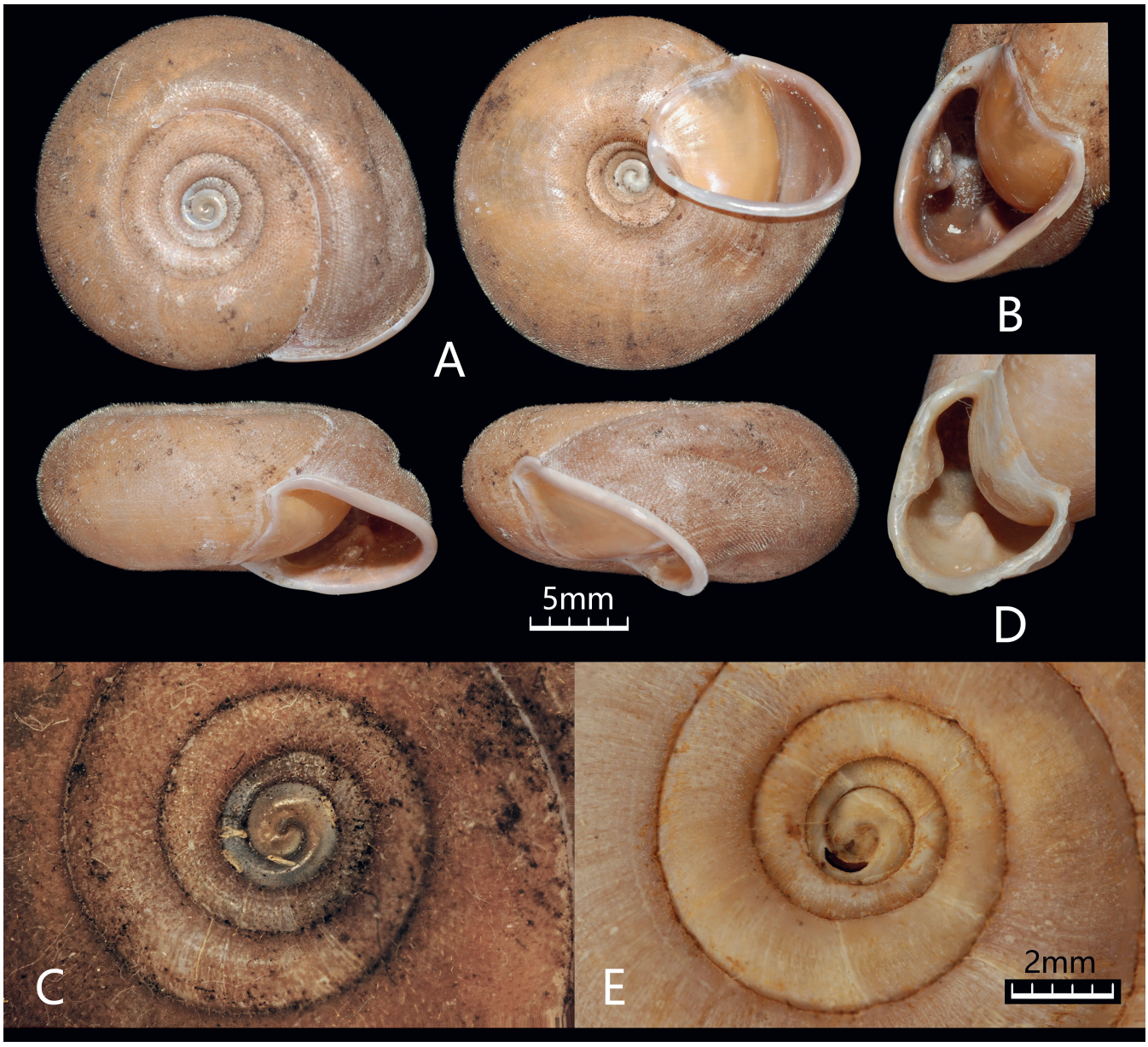


Figure 3 Photographs of *Trichelix xiaoxiang* sp. nov. A–C, fresh shell (holotype, HBUMM10059, China, Hunan Province, Yongzhou Shi, Jiangyong Xian, 40-meter-high stone hill in the suburb).; D–E, fresh shell without periostracal hairs (holotype, HBUMM10060, same data as holotype). Photographer Li-Wen Lin.

Paratype Fresh mature shell without periostracal hairs, HBUMM10060, same data as holotype.

Diagnosis Shell biconcave, body whorl well-rounded, aperture with two strong baso-palatal lamellar teeth.

Description Shell (Fig. 3A–C) rather thin, biconcave; uniformly yellowish, dextral, comprising 5.00–5.10 whorls. Whorls convex. Suture rather impressed. Upper surface with short periostracal hairs arranged in oblique rows along the lines of growth, lower surface with same short hairs around umbilicus. Without long bristles. Small tubercles are presented after the hairs have fallen off (Fig. 3D–E). Body whorl well-rounded. Aperture extended, trigonal, with two strong baso-palatal lamellar teeth inside the aperture at upper periphery and below periphery (Fig. 3B), and externally marked with strong to weak longitudinal furrows. Palatal tooth near columella short, approximately half the length of the other one. Peristome slightly reflected and only slightly covering umbilicus. Umbilicus obvious and

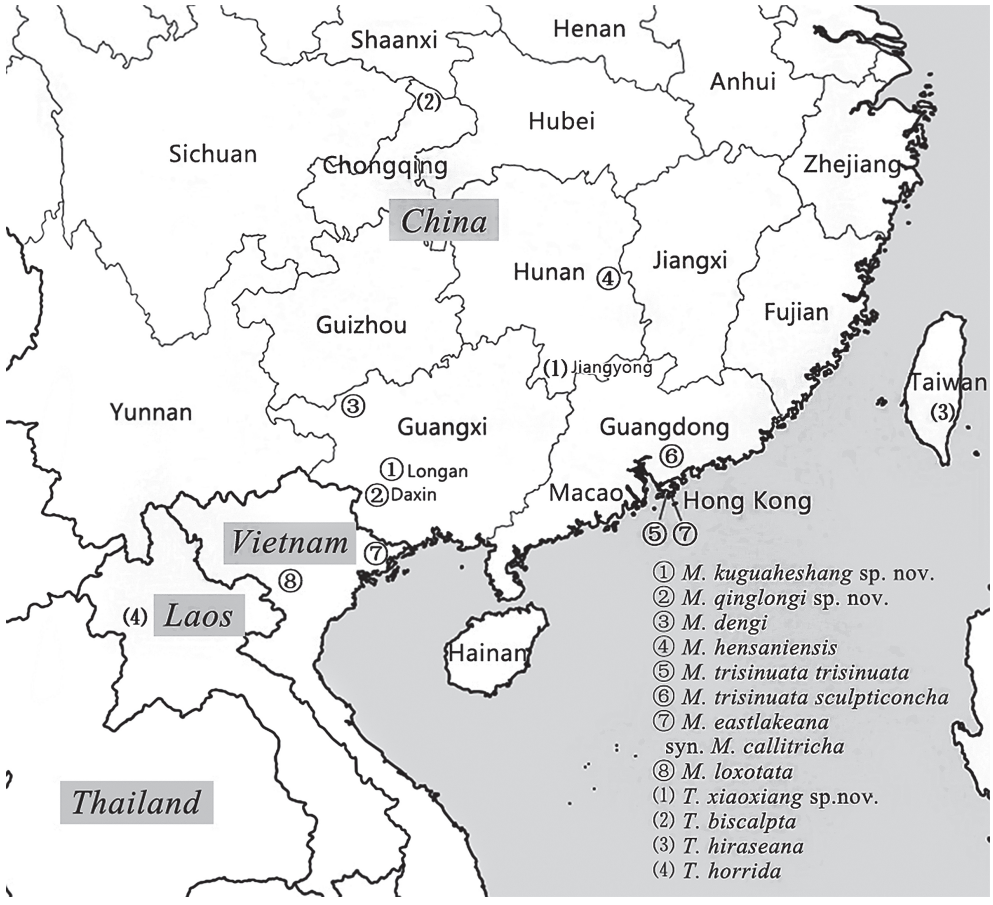


Figure 4 Distribution map of type localities of *Moellendorffia* and *Trichelix* species. New species, described within this paper, type localities are labelled as *Moellendorffia kuguaheshang* sp. nov.; , *Moellendorffia qinglongi* sp. nov.; (1) *Trichelix xiaoxiang* sp. nov.

deep, approximately 1/5 of shell major diameter and through which the protoconch is visible.

Measurements Shell major diameter: 21.0–22.4mm, shell height: 8.1–9.3mm (n=2).

Derivation of name This species is named after the type locality. Yongzhou was known as Xiaoxiang in ancient times, which means the intersection of the Xiaoshui and Xiangjiang rivers. This name is a noun in apposition.

Geographical range This species is known from the type locality only.

Habitat This species was found living on an arid hillside, on karst cliffs. A large number of dead shells were found, but no living individuals as yet (H.-F. Fan, personal comm.).

Remarks Compared with *Trichelix* species that have no lamellar teeth, the new species is distinguished by having baso-palatal lamellar teeth. *Trichelix biscalpta* (Heude, 1885) from Chongqing Shi [重庆市], China, has a long and strong upper baso-palatal lamella which forms a long and deep furrow on the body whorl and makes the body whorl convex; these characters distinguish *T. biscalpta* from the new species. Conchologically, the new species is similar to *Trichelix hiraseana* (Pilsbry, 1905) but is larger in average size and the periostracum hair is conspicuously shorter and denser than that of *T. hiraseana*. Compared with *Trichelix horrida* (Pfeiffer, 1863), the position of the upper baso-palatal lamella is different. Moreover, the longitudinal furrow on the ventral surface of the new species develops in the direction of the body whorl while the furrows of *T. biscalpta*, *T. hirasana* and *T. horrida* develop from the umbilical side to the margin of the shell in ventral view. The type localities and recorded distributions of other known species are far away from the type localities of the new species, as shown in Fig. 4.

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REFERENCES

ANCEY C–F 1887 Description of new genera or subgenera of Helicidae. *The Conchologists Exchange* **1**: 64.

HABE T 1957 Anatomy of *Moellendorffia (Trihelix) eucharistus* (Pilsbry). *The Nautilus* **71**: 8–9.

KERNEY MP & CAMERON RAD 1979 *A field guide to the land snails of Britain and North-West Europe*. Collins, London, 288 pp.

MINATO H 1971 Revision of the genus *Moellendorffia* from the Amami Islands. *Venus* **30**: 35–39.

MINATO H 1980 Genitalia of the Japanese land snails – XVI. *Moellendorffia (Trichelix) tokunoensis* Pilsbry & Hirase, 1905 from Tokunoshima Island. *Venus* **39**: 190–192.

MINATO H 2011 A memorandum of the studies of Japanese land snails (8), the genus *Moellendorffia* (Pulmonata: Camaenidae) from Amami Islands. *Chiribotan* **45**: 20–34.

PANHA S, SUTCHARIT J & CAN DN 2010 An anatomical note on *Moellendorffia eastlakeana* (Möllendorff, 1882) a camaenid land snail from Vietnam (Gastropoda: Pulmonata: Camaenidae). *The Nautilus* **124**: 20–24.

PILSBRY HA 1905 Notes on *Moellendorffia* and *Stegodera*. *The Nautilus* **19**: 63–67.

SCHILEYKO AA 2003 Treatise on recent terrestrial pulmonate mollusks. Part **11**: Trigonochlamydidae, Papillodesmidae, Vitrinidae, Limacidae, Bielziidae, Agriolimacidae, Boettgerillidae, Camaenidae. *Ruthenica* Supplement **2**: 1467–1626.

SCHILEYKO AA 2011 Check-list of land pulmonate molluscs of Vietnam (Gastropoda: Stylommatophora). *Ruthenica* **21**: 1–68.

SUTCHARIT J, INKHAVILAY K & PANHA S 2020 Taxonomic note on *Trichelix horrida* (Pfeiffer, 1863) from Laos, with a type catalogue of *Moellendorffia*, *Trichelix*, and *Moellendorffiella* (Heterobranchia, Camaenidae). *ZooKeys* **952**: 65–93. 10.3897/zookeys.952.52695.

WU S–P & WU W–L 1998 The distribution of Camaenidae in Taiwan. *Bulletin of Malacology, Taiwan* **22**: 43–48.

YEN T–C 1939 Die chinesischen land- und Süßwasser-Gastropoden des Natur-Museums Senckenberg. *Abhandlungen der Senckenbergisch-Naturforschenden Gesellschaft* **444**: 1–234.

YEN T–C 1942 A review of Chinese gastropods in the British Museum. *Proceedings of the Malacological Society of London* **24**: 170–288, pl: 11–28.